

AMENDMENT TO THE CLAIMS

The following listing of claims shall replace all previous listing of claims:

Listing of Claims

1. (Currently amended) An apparatus for measuring an attribute of ozone, the apparatus comprising:
 - a delivery pipeline vessel to contain ~~[[an]]~~ ozonated water ~~[[fluid]]~~ for delivery to a semiconductor process tool, the delivery pipeline vessel including a plurality of reflection sites;
 - a light source configured to direct a first band of visible light and a second band of visible light along a substantially shared path through the ozonated water ~~[[fluid]]~~ in the delivery pipeline vessel, the first and second bands of visible light diffusely scattered by the plurality of reflection sites, wherein ozone in the ozonated water ~~[[fluid]]~~ has a greater absorption associated with the first band of visible light than with the second band of visible light; and
 - a photosensor that senses the first band of visible light and the second band of visible light passing along the substantially shared path for measuring the ~~[[an]]~~ attribute of the ozone in the ozonated water ~~[[fluid]]~~.
2. (Cancelled)
3. (Currently amended) The apparatus of claim 1, wherein the ~~vessel comprises a delivery pipeline for the ozonated fluid to permit~~ permits in situ measurement of the ozone in the ozonated water during delivery of the ozonated water to the semiconductor process tool.
4. (Currently amended) The apparatus of claim 1, wherein the first band of visible light is associated with a yellow-red frequency and a first width, and the second band of visible light is associated with a blue frequency and a second width.
5. (Currently amended) The apparatus of claim 4, wherein the light source comprises a yellow-red light-emitting diode to provide the first band of visible light, and a blue light-emitting diode to provide the second band of visible light.
6. (Currently amended) The apparatus of claim 5, further comprising a second photosensor that senses the first band of visible light and the second band of visible light after they pass along

at most a portion of the substantially shared path to detect differential aging of the light-emitting diodes.

7. (Currently amended) The apparatus of claim 1, wherein the substantially shared path is defined in part by the plurality of reflection sites to increase a length of the path through the ozonated water [[fluid]] in the delivery pipeline vessel, thereby increasing a measurement sensitivity for the attribute of the ozone in the ozonated water [[fluid]].
8. (Currently amended) The apparatus of claim 1, wherein the delivery pipeline vessel comprises a material that defines an inner surface of the delivery pipeline vessel for diffusely scattering the first and second bands of visible light at the plurality of reflection sites.
9. (Currently amended) The apparatus of claim 1, further comprising a coating on an exterior surface of the delivery pipeline vessel for diffusely scattering the first and second bands of visible light at the plurality of reflection sites.
10. (Currently amended) The apparatus of claim 1, wherein the attribute of the ozone in the ozonated water [[fluid]] has an absorption band that overlaps the first band of visible light.
11. (Original) The apparatus of claim 1, wherein the light source comprises a light-emitting diode.
12. (Currently amended) The apparatus of claim 1, wherein the delivery pipeline vessel comprises a material selected from the group of quartz and a polymer.
13. (Currently amended) The apparatus of claim 1, wherein the photosensor senses the first band of visible light and the second band of visible light after the first band of visible light and the second band of visible light pass along the substantially shared path.
14. (Currently amended) The apparatus of claim 1, wherein the photosensor senses the first band of visible light and the second band of visible light as the first band of visible light and the second band of visible light pass along a portion of the substantially shared path.
15. (Currently amended) The apparatus of claim 1, further comprising ~~at least one of a~~ temperature sensor, for measuring a temperature of the ozonated water [[fluid]] in the delivery pipeline vessel, ~~and a pressure sensor, for measuring a pressure of the ozonated fluid in the vessel.~~
16. (Currently amended) An ozonated water generator, comprising:
a contactor for mixing water and ozone gas to produce ozonated water;

- a delivery pipeline in fluid communication with the contactor for delivery of ozonated water to a semiconductor process tool, the delivery pipeline including a plurality of reflection sites;
- a light source configured to direct a first band of visible light and a second band of visible light along a substantially shared path though the ozonated water [[fluid]] in the delivery pipeline, the first and second bands of visible light diffusely scattered at the plurality of reflection sites in the delivery pipeline, wherein ozone in the ozonated water has a greater absorption associated with the first band of visible light than with the second band of visible light; and
- a photosensor that senses the first band of visible light and the second band of visible light after they pass along the substantially shared path for measuring an attribute of the ozone in the ozonated water [[fluid]].
17. (Currently amended) A method for measuring an attribute of ozone in an ozonated water [[fluid]], the method comprising:
- selecting a first band of visible light for which ozone has a greater absorption than for a second band of visible light;
- directing the first and second bands of visible light thru a delivery pipeline ~~the vessel~~ to diffusely scatter the first and second bands of light at a plurality of reflection sites of the delivery pipeline ~~vessel~~;
- sensing the first band of visible light and the second band of visible light after they pass along a substantially shared path through the ozonated water [[fluid]]; and
- modifying a measured attribute of the ozone in the ozonated water [[fluid]] determined from the sensed first band of visible light in response to the sensed second band of visible light to improve the accuracy of the measured attribute.
18. (Currently amended) The method of claim 17, wherein modifying comprises correcting the measured attribute for an intensity loss of the sensed first band of visible light associated with at least one factor other than absorption by the attribute of the ozone in the ozonated water [[fluid]].
19. (Currently amended) The method of claim 18, wherein the at least one factor comprises at least one of bubbles, a reflectivity of a reflection site of the substantially shared path, an

impurity in the ozonated water [[fluid]], and a mechanical dimension of delivery pipeline a ~~vessel~~ containing the ozonated water [[fluid]].

20. (Currently amended) The method of claim 17, further comprising providing the substantially shared path in the delivery pipeline a ~~vessel~~ defined at least in part by the first and second bands of visible light being diffusely reflected at the plurality of reflection sites.
21. (Currently amended) The method of claim 20, wherein the plurality of reflection sites increase a length of the substantially shared path in the delivery pipeline ~~vessel~~.
22. (Currently amended) The method of claim 20, further comprising causing the ozonated water to flow through the delivery pipeline ~~vessel~~ from an ozonated water generator to a semiconductor process tool to permit *in situ* measurement of the ozone concentration in the delivery pipeline.
23. (Currently amended) The method of claim 17, further comprising alternately directing the first band of visible light and the second band of visible light along the substantially shared path, wherein sensing comprises alternately sensing the first band of visible light and the second band of visible light.
24. (Original) The method of claim 22, wherein alternately directing further comprises alternately directing no light along the substantially shared path.
25. (Currently amended) The method of claim 22, further comprising sensing at least one of the first band of visible light and the second band of visible light along after the first and second bands of visible light have passed at most a portion of the substantially shared path, and responsively maintaining an emitted intensity of at least one of the first band of visible light and the second band of visible light.
26. (Currently amended) A method for producing ozonated water having a desired ozone concentration, the method comprising:
 - selecting a first band of visible light for which the ozone has a greater absorption than for a second band of visible light;
 - generating ozonated water in a ozonated water generation device;
 - sensing the first band of visible light and the second band of visible light after the first and second bands of visible light are diffusely scattered at a plurality of reflection sites and pass along a substantially shared path defined in part by diffuse scattering at the

plurality of reflection sites through the ozonated water after the ozonated water flows from the ozonated water generation device towards a semiconductor process tool; modifying a measured ozone concentration determined from the sensed first band of visible light in response to the sensed second band of visible light to improve the accuracy of the measured ozone concentration; and adjusting at least one parameter of the ozone water generation device until the measured ozone concentration of the ozonated water substantially matches the desired ozone concentration.

27. (Previously presented) The apparatus of claim 1 wherein the attribute is ozone concentration.
28. (Currently amended) The apparatus of claim 1 wherein the attribute is absorption of the first or second bands of visible light by the ozone.
29. (Currently amended) The apparatus of claim 1, wherein the plurality of reflection sites affects an amount of diffuse scattering of the first or second bands of visible light.
30. (Currently amended) The apparatus of claim 1, wherein the photosensor is positioned along the substantially shared path for sensing the first and second bands of visible light as the first and second bands of visible light pass through the delivery pipeline vessel.
31. (Currently amended) The apparatus of claim 1, further comprising a second photosensor positioned along a longitudinal axis defined by an external surface of the delivery pipeline vessel for sensing the first band of visible light and the second band of visible light passing along the substantially shared path prior to the first and second bands of visible light reaching the photosensor.
32. (Currently amended) The apparatus of claim 1, wherein an interior surface of the delivery pipeline vessel or an exterior surface of the delivery pipeline vessel comprises a material to facilitate diffuse scattering of the first or second bands of visible light.
33. (Previously presented) The apparatus of claim 32, wherein the material is a coating.
- 34-35. (Canceled)
36. (Currently amended) The apparatus of claim 1, wherein the plurality of reflection sites facilitates a diffuse reflection by the first and second bands of visible light within the delivery pipeline vessel.

37. (Currently amended) An apparatus for measuring an attribute of an ozonated water [[fluid]], the apparatus comprising:

- a delivery pipeline vessel to contain the ozonated water [[fluid]], the delivery pipeline vessel defining a first end, a second end, a plurality of reflection sites, an interior surface, and an exterior surface, the interior surface and the exterior surface extending from the first end to the second end;
- a light source to direct a first band of visible light and a second band of visible light along a substantially shared path through the delivery pipeline vessel defined in part by the plurality of reflection sites, wherein ozone in the ozonated water [[fluid]] has a greater absorption associated with the first band of visible light than with the second band of visible light and the interior surface or the exterior surface facilitates diffuse scattering of the first and second bands of visible light at the plurality of reflection sites and;
- a photosensor positioned relative to the interior surface or exterior surface of the delivery pipeline vessel for sensing the first and second bands of visible light passing along the substantially shared path to measure the attribute of the ozonated water [[fluid]].

38. (Currently amended) The apparatus of claim 37, wherein the plurality of reflection sites increases a length of the substantially shared path relative to a length of the interior surface or exterior surface of the delivery pipeline vessel.

39. (New) An apparatus for measuring an attribute of ozone, the apparatus comprising:

- a delivery pipeline to carry ozonated water from an ozonated water generator to a semiconductor process tool;
- a light source configured to direct a first band of visible light and a second band of visible light through the ozonated water in the delivery pipeline, wherein ozone in the ozonated water has a greater absorption with the first band of visible light than with the second band of visible light; and
- a photosensor that senses the first band of visible light and the second band of visible light passing along a path for measuring an attribute of the ozone in the ozonated water.

40. (New) The apparatus of claim 39, wherein the delivery pipeline permits *in situ* measurement of an attribute of ozone in the ozonated water during delivery of the ozonated water to the semiconductor process tool.